Science Synthesis Prospectus

Prepared by PSW Core Science Team for Region 5, 12/12/2011

The initial goal for the science synthesis will be to produce a white paper that:

1) distills key recent advances in scientific knowledge that are likely to affect future forest management planning,
2) considers several themes that cut across traditional disciplines to help managers address key challenges more holistically,
3) examines select focal topics and questions that will be identified and prioritized through discussions among Regional staff and PSW scientists, and
4) provides guidance for incorporating science in land management at broad scales, encompassing areas from thousands to hundreds of thousands of acres.

A guiding principle will be to approach the effort as a **pre-planning science consistency review** to highlight critical scientific issues that the science team believes would be important to consider in the plan revision process. This synthesis will be neither comprehensive nor conclusive. In this regard, the synthesis will not be able to address all issues relevant to land management planning, and it will not be an exhaustive review of the literature but would focus on information in significant papers, particularly those within the realm of expertise represented by the team. Rather, we will target specific topics that tend to draw considerable attention, and for which there is pertinent science. The resulting white paper would be designed to help managers navigate through and apply the knowledge. The science synthesis will proceed under the tenet of not telling managers what they should do, but rather providing information that managers can use to make more informed decisions and better achieve their goals and objectives. The General Technical Report, "An ecosystem management strategy for Sierran mixed-conifer forests," (GTR-220) will serve as a model in terms of the target audience, content, and formatting; culminating in a document that emphasizes a conceptual approach with supporting examples and references.

The synthesis will have an **executive summary** that distills the important findings from recent syntheses, seminal papers and research studies, and points to examples of forests where key concepts have been applied and documented. The summary will be supported by an appendix of references to the scientific publications that support these findings.

The synthesis will consider **topics associated with various ecosystem elements, goods and services**, as well as address **cross-cutting themes** that need to be considered for ecosystem management. We have identified examples of focal questions that we plan to consider; that list will be refined through continued dialogue between the science team and the Regional staff. An overall theme of the synthesis will be to consider the need and challenge in shifting **from fine-scale knowledge (e.g., stand-level effects) to a landscape scale** while connecting approaches across **disciplines**, as well as to identify **critical gaps in knowledge and uncertainties**.

Examples of **topical** questions are:

- What new science can help us understand the trade-offs between the potential impacts of forest treatments on forest vegetation, terrestrial and aquatic habitat, and water resources and the potential impacts of wildfire if treatments are *not* implemented?[1]
- How do soils and forest types, nutrient budgets, fire dynamics, and restoration treatments shape vegetation and ecosystem processes from the stand- to landscape-scale?[2]
- What is the potential, and what are the assumptions needed, to scale up from focal species considered "at risk" to restore and sustain landscape-scale habitats at each relevant scale (microhabitat, home range and landscape, short-term vs. long-term) in an ecosystem approach that considers vegetation and fire ecology?[3]
- How are socioeconomic and sociocultural factors, such as changes in land use and recreation, influencing the provision of ecosystem services?

Examples of **cross-cutting** questions are:

- How can **ecological restoration** a*nd* **ecological resilience** be applied and distinguished in management-relevant terms?
- At spatial scales broader than stands and temporal scales longer than several decades, how could a landscape be managed to achieve forest resilience, provide for habitat, and maintain the role of fire?
- What key pieces of recent social science regarding human and forest relationships inform the management of forests for sustainability (social, cultural, economic, ecological, and institutional)?
- How may critical influences such as climate change, fire, air pollution, species invasions, sociodemographic and cultural patterns, and land use changes alter approaches to land management?
- What are relevant **baselines** for evaluating effects (i.e., to what conditions or time period do we compare changes) across ecological components? For example, what range of fire effects might have been typical in mid-elevation Sierra Nevada landscapes in which fire was operating under a more natural role?
- What are opportunities to answer important science questions through **adaptive management** initiatives at broad scales such as 200,000-400,000 acre demonstration areas, or data collection efforts across even larger landscapes?
- What are strategies for enhancing monitoring efforts at the broader scales to evaluate performance and answer important science questions?

This integrated synthesis paper could be developed over time into one or more General Technical Reports (GTRs) with additional resources and time to execute them.

Appendix for Sierra/Cascade Dialogue

1. **What new science can help us understand the trade-offs between the potential impacts of forest treatments on forest vegetation, terrestrial and aquatic habitat, and water resources and the potential impacts of wildfire if treatments are *not* implemented?**

Given that we are experiencing climate change and the chronic risk of fire in California ecosystems, we intend to describe a framework for better understanding the short-term vs. long-term effects of forest management (or the lack thereof) on such issues as: wildlife habitat (aquatic and terrestrial), fire hazard, water quality and quantity, communities, etc.

2. **How do soils and forest types, nutrient budgets, fire dynamics, and restoration treatments shape vegetation and ecosystem processes from the stand- to landscape-scale?**

In order to better understand the trade-offs discussed above, we need to discuss how our knowledge of small places (plots/stands) scales up to larger places (landscapes/watersheds). Nearly all of our information about such things as vegetation dynamics, soils, fire effects, etc. that is derived from carefully controlled experimentation comes from small places (plots/stands). What we know about larger places is mostly based on observation and inventory.

3. **What is the potential, and what are the assumptions needed, to scale up from focal species considered "at risk" to restore and sustain landscape-scale habitats at each relevant scale (microhabitat, home range and landscape, short-term vs. long-term) in an ecosystem approach that considers vegetation and fire ecology?**

Much of our information on many wildlife species, vegetation, or environmental phenomena (e.g., water) is based on studies using reductionist scientific methods. In other words, focused on a single species or small group of similar species at particular scales (space and time) thought to explain biology or a particular function. Yet, nearly all ecological patterns (i.e., composition, structure, process) are sensitive to scale. We plan to consider and describe approaches to assessing information gathered from different scales through common context (e.g., vegetation as habitat, fire ecology, climatic variation) to facilitate integration across disciplines at broader scales.

4. **How are socioeconomic and sociocultural factors, such as changes in land use and recreation, influencing the provision of ecosystem services?**

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In the context these questions the following important focal areas (i.e., reductionist focal areas) emerge as being of particular interest:

Wildlife ecology – including, focal species of interest (fur bearers, spotted owls, etc.), amphibians, biodiversity, etc.
Fire – including fire ecology, fire risk and hazard (they are different), fire safe communities, carbon sequestration, etc.
Water – including water quality & quantity, aquatic ecology, biodiversity
Vegetation – including forest ecology, wildlife habitat, restoration (structure, process), resilience, biodiversity, rare species
Socioeconomics – including ecosystem services, fire safe communities, biomass, etc.